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ABSTRACT

Reasons for changing telephone systems at colleges and universities and the preparation and evaluation of requests for proposals (RFP) are discussed. The negotiation and monitoring of the contract are also addressed. It is noted that contracting for a new telecommunications system is extremely complex. Reasons for changing systems include cost savings and the fact that an existing telephone system has technological or user service limitations. A number of user features of computerized electronic private automatic branch exchanges (PBXs) are described, along with considerations for integration with data communications. Before the RFP is written, it is proposed that extensive preparatory work be done, including hiring a consultant, conducting a study of the existing system and a needs analysis, determining design criteria for the new system, determining costs or savings with a financial analysis model, and establishing a time frame for completion of the RFPs. Areas that should be covered in detail in an RFP for a telecommunications system are discussed, including bidder qualifications, technical specifications, installation and implementation guidelines, and user training. The bidders' conference and site survey are also covered. Aspects of the system that should be evaluated before acceptance are identified, and ongoing monitoring of the system is briefly addressed. (SW)

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Contracting for Telecommunications Systems

by ARTHUR W. BRAUTIGAM

Changes in recent years concerning traditional means of securing telephone services and equipment have affected all colleges and universities. These changes include rapid technological advances, increased competition in the telecommunications marketplace, and the settling of a Department of Justice antitrust suit against American Telephone & Telegraph Company. As a result, many institutional administrators have made the decision to invest in a lease/purchase or outright purchase of a telecommunications switching system; other administrators are considering such a move. When determining whether or not to acquire a new telecommunications system, it should be kept in mind that contracting for such service is an extremely complex and labor-intensive effort; it should not be undertaken without the strong support of the highest levels of institutional administration.

Arthur W. Brautigam is communications manager at the University of Vermont. Extensive contributions to this article were made by Homer S. Fisher, executive vice chancellor of the University of Tennessee. This article is a chapter from the upcoming NACUBO publication Contracting for Communications Services, *available for $15 from the NACUBO Order Desk. It is the first in a planned series of supplements to the 1983 NACUBO book* Contracting for Services.

Reasons for Changing Telephone Systems

Cost. The possibility of considerable cost savings has caused many administrators to consider the purchase of a telecommunications switching system rather than to continue renting from local companies. Although savings vary with system size and other factors, they may equal the purchase price of a switch during a period of from seven to ten years, or even less. Rental of the same equipment for long periods could result in paying for it many times over during its life.

Further, the cost of leased systems is rising rapidly in most parts of the country; a major concern to institutions. This is especially true of older, electro-mechanical switches.

Technological Change and User Needs. Many institutional administrators are considering replacement of an existing telephone system because of technological or user service limitations. Correction of problems arising from such limitations may require a complete system change.

One problem is that the current switching system may have been outgrown. This could involve the capacity of the switch itself or the capacity of the cable plant that connects various buildings on a campus. When a switching system has reached its capacity, no new lines can be added to the existing telephone system, and this situation soon becomes intolerable in a dynamic institution such as a college or university. Departmental moves and consolidations and changes in departmental responsibilities often necessitate additional telephone lines on campus.

The problem of inadequate cable plant between buildings can be solved by installing new cable, but this is time-consuming and expensive. With the rapid changes in the current telecommunications environment, many telephone companies are reluctant to invest in new plant facilities that may be used for only a short time. This can pose major difficulties for an institution if, for example, there are no spare cable pairs for a computer facility that leases telephone company cable pairs to connect to terminals in other campus buildings.

Other, less pressing problems that an administrator might wish to solve with an upgraded system include completion problems, such as dial tone delays and call blockages, which relate to the traffic capacity of the current system. In most telephone systems, dial tone is heard as soon as the receiver is taken off-hook. In systems that are nearing traffic capacity, there is a delay in providing dial tone to the subscriber; the delay is caused by a lack of equipment in the switch to receive and interpret the number dialed by the subscriber. In addition, systems that are nearing capacity will sometimes prevent one subscriber from talking to another because no physical path of connection is available. This situation is referred to as call blockage.

All computerized electronic private automatic branch exchanges (EPABXs or simply PBXs) currently available base their system design on extensive use of single-line telephones and the availability of many user-oriented features. These factors increase the efficiency of internal communications and reduce costs over older systems that require multi-line instruments and their associated key telephone units. The most popular user features include:

1. *Call Forwarding*, which allows the user to forward his or her calls to another extension if the dialed number is busy or does not answer, or if the user wants calls forwarded to his or her destination.

2. *Call Hold*, which allows the user to place an incoming or outgoing call on "hold" and accept or place another call on the same line. It emulates the function of the "hold button" on multi-line telephone instruments and saves the cost of additional lines.

3. *Automatic Call Back*, which allows the user to instruct the central processor to return a call when a previously busy extension is free to accept an incoming call.

4. *Call Pick-up*, which allows for coverage of unanswered calls by any other extension within a predefined group of extensions.

5. *Conferencing*, which allows the user to establish three- to six-party conference calls without attendant assistance. (The number of conferees depends on the system being used.)

6. *Call Transfer*, which allows the station user to transfer an incoming call to another extension without attendant assistance.

7. *Attendant Camp-on*, which allows the attendant to hold incoming calls in special waiting modes if the desired station is busy with automatic ringing, and connect to the desired station when it becomes idle.

Still other popular features include automatic recall, call queuing, diagnostic capability, flexible station numbering, least-cost long distance routing, and management analysis reporting.

Many PBXs use a distributed architecture whereby remote equipment, including processors, can be located at a great distance from the central processor. This type of architecture is compatible with microwave or fiber optics transmission systems, thus making possible the interconnection of geographically dispersed sites in a cost-effective manner. Such capability could be used to eliminate the cost of leased tie lines between switching systems serving various campuses or to provide a single communications system for a multi-campus institution. Another advantage of most new systems, especially for smaller institutions, is that they require much less space than did earlier installations.

Integration with Data Communications. The use of a modern PBX system that can easily be integrated with microwave and fiber optics transmission systems may serve as a means whereby campuses can share expensive instructional resources. Data communications capabilities are becoming increasingly important for many colleges and universities; switching of data through a PBX with a digital matrix is one way this can be accomplished. Thus, data terminals use the same relatively inexpensive twisted pair cable plant used for voice. Such a technique is worth investigating if voice and data communications requirements demand attention simultaneously.

The more technologically advanced systems offer such data communications features as:

1. *Protocol conversion*, to allow the interconnection of dissimilar data devices.

2. *Port contention* and modern pooling capabilities.

3. *Access to electronic mail systems.*

4. *Gateways to other data communications networks*, such as local area networks, public networks, and peripheral systems.

Care should be used in selecting an integrated voice/data switching system. The average characteristics of a voice call differ greatly from those of a data call. If the number of data calls becomes relatively high, it is possible to tie up all of the switching system's internal talk paths, thus blocking completion of any additional calls. Load balancing within the switch or the selection of a switching system with a nonblocking matrix are possible solutions to this problem.

Another consideration when deciding on the option of voice and data integration is exposure to system failure, in which both voice and data communications can be lost. A possible solution to this problem is higher levels of redundancy than those typically found in a voice-only switch.

Preparation for a Request for Proposal

Once a decision has been made to upgrade an existing telecommunications system or procure a new one, extensive preparatory work should be done before a request for proposal (RFP) is written. Such activity should include a study of the existing telephone system and a thorough needs analysis, determination of design criteria for the new system, financial analysis, and establishment of a realistic time frame for accomplishing the change. For many institutions, the engagement of a qualified consultant is a first and possibly the most important step in approaching the other preparatory activities listed above.

Engaging a Consultant. Even though an institution may have a communications manager on its staff, hiring a consultant is probably well worth the cost of services provided. The institutional administrator can expect the consultant to assist in preparing the RFP, check for mistakes, and note omissions. The consultant can be engaged to perform any part or all of the process of acquiring a new telecommunications system, including: (1) feasibility study or needs analysis, (2) development of specifications for a system that meets current and projected requirements, (3) evaluation of bids, and (4) supervision of installation and cutover.

The contract with a consulting firm should indicate in detail the activities to be undertaken in regard to each phase entrusted to the firm. The price to be paid for services and a definite time frame for completing each phase should also be indicated.

Selection of a consultant should involve conversation with many consultants, checking of references and client lists, and a comparison of fees to be charged. In addition, an evaluation should be made of the qualifications of the consulting firm's

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staff, the size and type of prior installations undertaken by the consultant, and the presence or absence of contract disputes on previous awards handled by the consultant. A sample list of questions that could be asked of persons referenced by the consultants follows:

1. Was the consultant's approach to the problem satisfactory?

2. Were detailed specifications, traffic engineering and growth, and all other aspects of telecommunications considered?

3. Was sufficient staff committed to the project and available when needed?

4. Were all costs included in the original proposal?

5. When was the work performed for your institution and was it completed within the time promised?

6. Did you accept the consultant's recommendations and, if you did, were they beneficial to your operation?

7. Did bid specifications developed by the consultant result in an undisputed contract award?

8. Why did you select this particular firm?

9. What type of equipment does your institution have, and how many main stations?

10. Would you contract with this firm for future requirements?

11. Were other firms considered?

In addition to considering the engagement of a consultant, administrators may wish to refer to telecommunications trade journals to keep current with the constant changes occurring in this field.

Study of Existing Telephone System and Needs Analysis. A thorough study of the institution's current telecommunications system should be undertaken in conjunction with the telecommunications staff and the consultant, if one has been engaged. The study should include a determination of the type of system involved, kinds of services it provides, and its problems.

The size and cost of the current system should be firmly established. The local telephone company may be able to assist in this process by providing their system records and conducting an inventory of the existing system.

The last major step in studying the current system is to determine present and future voice and data communications requirements. Transmission medium used, cost of leased circuits, required or desired transmission speeds, and numbers and types of terminals are critical items in this portion of the study. Compilation of study results should allow a determination of the institution's basic communications needs.

The study can also provide the basis for a count of the number of existing telephones per building. As PBX systems are based on single-line instruments, this count can be used in the Request for Proposal to provide an estimated number of lines for bidding purposes. Either of two methods can be used to obtain line count: (1) conducting an inventory of the existing system, which would involve counting each piece of telephone equipment on campus, or (2) analyzing the institution's telephone bill and using this source to determine type and quantity of equipment used. Small institutions may wish to conduct an inventory, since this often can be combined with other, ongoing functions, such as cleaning and periodic equipment inventories. The second method is less time-consuming and the dynamic nature of most institutions of higher education suggests that it may be as accurate as an inventory, given the amount of time that must pass between release of an RFP and actual installation of a new system.

Determination of Design Criteria. The next step in preparing to write a request for proposal is determining design criteria. Appropriate members of the campus community should be involved in establishing design criteria; such members include representatives from telephone services, the computer center, physical plant, purchasing, and user departments. If a consultant was engaged, he or she should also be included. This involvement is necessary to insure a system design that will be accepted after installation. In addition, the institutional administrator may wish to solicit suggestions from several major vendors, as there may be more capabilities available than are known to institutional personnel.

Following are some questions to be considered when preparing to write the RFP:

1. What features are critical to the telecommunications needs of the institution?

2. What additional features would be nice to have if they were included in the system at little or no additional charge?

3. Should student residence hall service be included?

4. How much outside plant construction will be required?

5. Are simultaneous voice and data transmissions required?

6. Should security and energy management capability be included?

7. What type of long-distance control system should be used?

8. What "grade of service" and "traffic capacity" are necessary?

9. What kind of growth can be estimated in terms of telephones? In terms of traffic?

10. What other possible future needs should be considered?

11. How can the use of multiline instruments be reduced to a minimum?

12. Should student long-distance resale be employed?

13. Should maintenance be handled in-house or by contract?

Financial Analysis. A good financial analysis model is helpful in determining costs of the proposed new system or savings to be gained from it. A computer model can be used that describes in detail the costs of the present system and what a new system would cost; the pricing section of the RFP can be structured such that numbers can be transferred into the model with relative ease.

Although the economic life of a system in the telecommunications industry has been taken to mean five to seven years, a financial analysis is complicated by the fact that the actual functional life of some system components may be upwards of 20 years. Further, while considering costs of the new system, it is important not to "buy too small." Forecasting system growth is extremely important.

One large institution conducted a ten-year cash flow analysis, comparing its existing Centrex system to the proposed schedule of costs for two different PBXs and a private PBX

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of comparable size. The preliminary analysis indicated that the ten-year savings of a new switch contrasted with the existing system would be approximately four to six million dollars. In addition to projected savings in equipment costs, savings in moves and changes of equipment were projected at more than $40,000 annually.

Timetable for Completion of RFPs. A realistic timetable should be established for writing, issuing, and receiving RFPs from vendors; the timetable should be followed as closely as possible, with some slack time built in to each critical point. Often, vendors request more time than is originally allowed for in the RFP. Providing adequate time for vendors to respond benefits the institution because it allows vendors the opportunity to fully develop proposals and to refine pricing schemes. Suggestions for an appropriate time allowance range from seven to 18 weeks.

Request for Proposal

If a consulting organization is engaged to assist in writing the RFP, its standard request for proposal should be used as a starting point for the institution. To this base should be added any requirements that are unique to the particular college or university. Areas that should be covered in detail in any RFP for a telecommunications system are described below.

Bidder Qualifications. Specific qualifications for bidders should be set forth, in order to safeguard the institution's interests and to indicate to bidders as precisely as possible what would be expected of the chosen vendor. Qualifications should be based on information such as the following:

1. Organization, size, and structure of the firm (size to be considered in relation to the work to be performed).

2. The firm's prior experience in the field (a minimum of three years' experience in the telecommunications industry should be required).

3. Availability for on-site inspection of at least one system of the type proposed that has been operational for at least six months.

4. Qualifications of the staff to be assigned to the project. Staff education, position in the firm, and years and types of experience should be considered.

5. The bidder should be the original equipment manufacturer or be able to obtain cosignatures on all contract and maintenance documents of the manufacturer (a statement from the equipment manufacturer, if this firm is different from the vendor, should indicate that the relationship between the two is stable, is not close to expiration, and that the manufacturer would provide maintenance and spare parts for a minimum of ten years if the vendor should go out of business or not perform properly).

6. Documentation of the firm's financial stability, including audited financial statements and declaration of any outstanding litigation against the firm.

Criteria that will be used in selecting a vendor, basic bidding procedures, required response format, and a calendar of events in the bidding and evaluation processes also should be included.

Technical Specifications. When determining technical specifications of the required system, it should be kept in mind that specifications should not only address current requirements but also the projected expansion needs of the system. The institution should have an estimate of costs of such expansion.

Technical specifications should include a list of equipment requirements by type, broken down into how much of each type will be required at cutover, what PBX cabinet capacity is required for each type of equipment, and ultimate capacity of the switch. This section can include a functional system design specification that describes requirements for control technology, network architecture, memory capacity, redundancies, power failure protection, degree of user control, availability, and type of management information systems to be provided, and others. It is suggested that these specifications remain somewhat flexible, in order to [illegible] ideas from vendors that may prove to be better than the institution's original [illegible].

This section [illegible] should include a list of required station, [illegible] and system features. Definitions of each feature may help insure that all vendors interpret requirements correctly. If technical specifications are broken down into component parts for unit pricing, a useful cost comparison can be made.

Installation and Implementation Guidelines. A section of the RFP should delineate installation and implementation guidelines. Paragraphs might include prebid layout and design, vendor's implementation responsibility and installation guidelines, user training guidelines, cutover and postcutover requirements and acceptance testing. Cutover requirements might include such items as number of vendor and manufacturer personnel to be on site at the time of cutover and the vendor's responsibility in case of an unsuccessful cut. Postcutover requirements include system documentation in the form of technical manuals, cable plans and allocations, and as-built drawings. Acceptance testing and traffic study re-

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quirements also should be included, as well as requirements for restoring any plant or grounds area that was disrupted during installation.

User Training. The importance of specific requirements for user training cannot be overemphasized. In most cases, vendors will supply exactly what is asked for in the RFP. If requirements are not specific, useful user training may not be provided; without well-trained users, the best of systems cannot be used effectively.

To insure that proper training is accomplished, the following items should be specified in the RFP: (1) number of training sessions to be provided, (2) size of each class, (3) training materials to be used, and, most important, (4) that training be conducted using equipment that is both physically and operationally identical to that being installed. Console operator training should be specified in detail and should consist of hands-on training before cutover and the presence of a qualified trainer in the console room for a period after cutover to assist operators in using the consoles.

In addition, the RFP should specify a number of small training sessions after cutover for those personnel unable to attend previous sessions. Finally, requirements for training of institutional personnel to assume responsibility for ongoing user-training should be specified.

Other Sections. Other sections of the RFP should describe in detail warranty and maintenance requirements, how moves and changes will be accomplished and charged, and the information expected from each vendor at the time of proposal submission. The latter might include such items as technical data on proposed equipment, company financial background, reference lists, bid prices, and contractual information and proposed project schedule.

Finally, an enumeration of contract requirements and construction specifications should be included in the RFP. This section should include any institutionally unique requirements, such as preservation of historic buildings, bid and performance bonds, outside construction requirements, and funding contingency clauses.

In short, the RFP should give vendors as much information as possible concerning installation conditions at the institution before the document is released. This allows for the lowest possible price to be quoted by each vendor and helps insure that the institution is purchasing a system that meets its unique requirements.

Distribution of the RFP. There are two methods for determining vendors to whom the RFP will be distributed. One method is to notify selected vendors of the document's availability; this insures a limited distribution to only those vendors known to meet the basic qualifications set forth in the RFP.

To use this method, vendors first must be prequalified, which can be accomplished by sending a request for information (RFI) to a group of vendors involved with telecommunications. The qualifications that later will be used to select the vendor for the project should also be used in the RFI to prequalify or narrow the field of vendors who will be sent the request for proposal. When an RFI is used, it must be clearly stated that the document is for information purposes only; it is *not* an invitation to bid.

A second, and probably less satisfactory method of determining distribution of the RFP, involves advertising in national telecommunications trade journals. This method insures the widest possible distribution group, but also may bring in an excessively large number of responses, making evaluation of proposals difficult. Legal requirements and unique preferences of individual institutions will help determine the choice of distribution method.

Bidders' Conference And Site Survey

Between release of the RFP and receipt of proposals, two important events must take place: the bidders' conference and the site survey. Attendance at the bidders' conference, which usually is held two to three weeks after release of the RFP, should be mandatory for all prospective vendors. The conference serves as a forum for answering vendors' questions, for emphasizing and clarifying portions of the document, and for determining the seriousness of the vendors. Any changes or clarifications resulting from the bidders' conference should be issued in writing in the form of an addendum to all vendors. It may be helpful to record the conference, in order to avoid misunderstandings later.

The site survey, which is as important as the bidders' conference, is used to familiarize vendor personnel with the institution's campus and buildings. Administrators may wish to schedule a single site survey lasting several days for all vendors, which results in considerable savings over holding separate surveys for each vendor and also insures that each vendor receives the same information.

One institution combined its bidders' conference and site survey, which took place in one day. To expedite the survey, vendors were given a very detailed description of the physical plant, with maps, cable routing drawings, etc., in the RFP. This was used in place of having the vendors physically survey each part of the campus, although they were shown the different types of campus buildings, the duct bank system, the tunnel system, and some of the existing main cable feeds and splices.

If the site survey involves visiting every building on campus, a planned itinerary is of major importance. Other suggestions for a successful survey include:

- Use of those persons who best know the campus, the underground utility locations and obstacles, and types of buildings involved. Such persons could include physical plant staff and the institutional engineer. As vendor personnel can be expected to ask questions about any aspect of the campus and its buildings, the site survey will be greatly facilitated by the ability of institutional staff to answer the questions.
- Insuring that the person conducting the survey knows the cable entrance and telephone terminal locations in each building.
- Designation of the team or person to be responsible for answering questions.
- Making sure that unusual or historic buildings, which may involve unusual construction details, are pointed out, as well as areas that should not be considered for routing of outside plant because of planned construction or other reasons.

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The most important advice that can be given to insure realistic pricing and acceptable proposals is to make available as much information as possible to all vendors. This includes campus site plans showing underground utilities, building floor plans, and any other documents that could assist in proposal preparation. It is also important to be sure that all vendors receive the same information, so that any favoritism, or impression of favoritism, is avoided.

Evaluating Proposals

Various methods may be used in evaluating proposals. One way is to use a two-phase evaluation process consisting of a first-phase critical analysis, followed by a much more detailed analysis of those proposals that were judged "acceptable" in the first phase. First phase anaiysis consists of rating each proposal as acceptable (meets specifications) or unacceptable (does not meet specifications) in a series of critical areas such as ten-year cost, voice features, and data transmission capabilities. Any unacceptable rating is cause for rejection of the proposal. In certain areas, this rejection could be conditional, based on the vendor's ability to clarify its response within a limited time from notification of rejection. Any vendor who receives all "acceptable" ratings or clarifies its responses satisfactorily would then be subjected to a second phase of evaluation.

The second phase involves subjecting each proposal to a detailed examination by a series of committees. The committees should reflect an institution's particular needs, but could include inside and outside plant, voice communications, data transmission, system operations, and financial areas. To simplify writing a final recommendation, a numerical rating, using a scale of 0 to 4, may be assigned to each vendor's proposal.

Each committee may be asked to prepare a written narrative explaining its ratings of vendors. Numerical ratings would then be weighted according to a predetermined point value scale and these weighted scores summed to provide a total score for each vendor. Total scores and the concerns expressed in the written report would then be used by an overall evaluation committee—which typically is composed of the chairpersons of the examining committee—to formulate a final recommendation.

Within this organizational structure, an effective approach to evaluation is to subject vendor responses to discrete financial, service, and technical evaluations that are then summarized to form a framework that will permit a clear understanding of the rationale for the final decision. This approach includes not only a thorough assessment of responses to the RFP, but also a visit to installations of equipment at each responding firm.

The financial evaluation should reflect ten-year cost assessments that include purchase price, maintenance cost, and estimated cost of moves and changes. The service evaluation should focus on managerial organization, financial stability, experience, and past performance of vendors. Finally, the technical evaluation should include an initial assessment of compliance with the institution's minimum specification requirements. The evaluation summary would reflect total points earned by each vendor in the financial, service, and technical areas.

The evaluation document should address issues pertaining to installation and cutover because these are critical aspects of the comprehensive procurement and installation process. A key point is to be sure that all evaluation criteria, with their point values, are clearly identified in the RFP, so that any possible appearance of favoritism may be avoided.

Negotiating and Monitoring the Contract

The purchase contract should include numerous provisions related to installing the system. Specific reference should be made to the requirement for an installation milestone chart and subsequent progress reports. Specifications for the equipment room should be fully [illegible], including space [illegible] adequate [illegible] proper [illegible] electrical [illegible] should [illegible] proprie[illegible] the sys[illegible] for fir[illegible] ture or [illegible] security.

If the [illegible] to use subcontractors, the institution should retain the right to give prior approval of them. Throughout installation, the contractor should be liable for plant and equipment repairs necessitated by his or her work. The contract also should provide for the rejection of defective work and the institution should insure that regular inspections of work performed are conducted by institutional representatives and/or the consultant. Careful attention should be given to the resodding and repaving of areas disrupted by cabling; these areas will be most visible to the external community and therefore warrant such attention.

Negotiation and signing of the contract should be accomplished by one person, who represents the institution. Once the contract is signed, the chief business officer is responsible for administering it; such responsibility may be delegated to a telecommunications manager or other appropriate officer.

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Installation. Advance communication with building occupants is essential prior to the arrival of staff involved with the installation of equipment. With appropriate planning and an understanding of activities taking place within various buildings, ongoing instructional, research, and service activities of the institution will not be disrupted. A well-planned installation should not be significantly visible in a distracting way to the campus community.

Cutover. Cutover should be defined as the point at which the customer has accepted the system by formally committing that all the equipment and software is accepted, conforms to contract standards, is properly installed, and has passed complete systems tests. Even though the system may previously have been placed in service, final cutover has been completed only when the customer has signed a statement indicating full acceptance of the system.

System Evaluation Prior to Acceptance. Evaluation of the system that should occur prior to acceptance includes verification of the following:

1. Voice and data transmission are consistent with specifications of the system.
2. All equipment features and capabilities specified in the contract are available and operating with absolute reliability.
3. Trunk and tie lines are operating properly.
4. Prescribed training programs were satisfactorily completed.
5. Backup capabilities are functioning properly.
6. Automatic route selection features are functioning properly.
7. Functioning of diagnostic capability has been demonstrated.
8. All wiring, grounding, and equipment installation is complete and in accordance with industry standards.
9. Full documentation of the system is on file with the institution, including detailed specifications of the cable plan.
10. All installation tests provided by the equipment manufacturer are completed.
11. All deficiencies identified by the institution and/or its consultants, and made available on a punch list, have been corrected.
12. All telephones contracted for are installed, and any problems of each station installation were reported to the vendor.
13. Comments from station users, including problems with equipment and questions about the new system have been noted.

Nothing can be assumed. It is much easier to have problems corrected and changes made prior to final system acceptance (that is, before the vendor receives final payment for the system) than afterward.

Ongoing Monitoring of the System. All using departments should be surveyed within 6 months after installation of the telephone system to uncover any problems or questions that have arisen since acceptance.

For further monitoring, a telephone system should be accompanied by some type of "System Management Device." This can yield reports about the "state of the system," including (1) diagnostic reports to determine whether all system components are functioning properly, (2) trunk usage reports to determine whether all system components are functioning properly, and (3) call detail reports that indicate calls made by each extension for a specific period, giving number called, time of day, and cost. Reports such as these can be monitored periodically to determine whether the system may be in need of adjustment. For example, more trunks may be needed or certain extensions might warrant some restriction from dialing long-distance calls.

It should never be assumed that a telecommunications system continues to function on its own after installation; someone must be assigned responsibility for monitoring it. The larger the system, the more carefully it must be monitored to avoid service deterioration or increasing costs that might be unnecessary.

Maintenance with the vendor should include (1) remote diagnostic capability, (2) periodic system checkups, even when no specific problem exists, and (3) responsibility on the part of the vendor to inform the institution as improved software is available for the system.

Situations that might indicate the system is in need of adjustment include rising long-distance call charges, increased frequency of repairs, and increased complaints about system function from station users and callers.

In summary, installation of a successful telecommunications system is the result of thorough planning, careful contract negotiation, continued monitoring of vendor performance, and realistic evaluation of results. ◆

business officer

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